

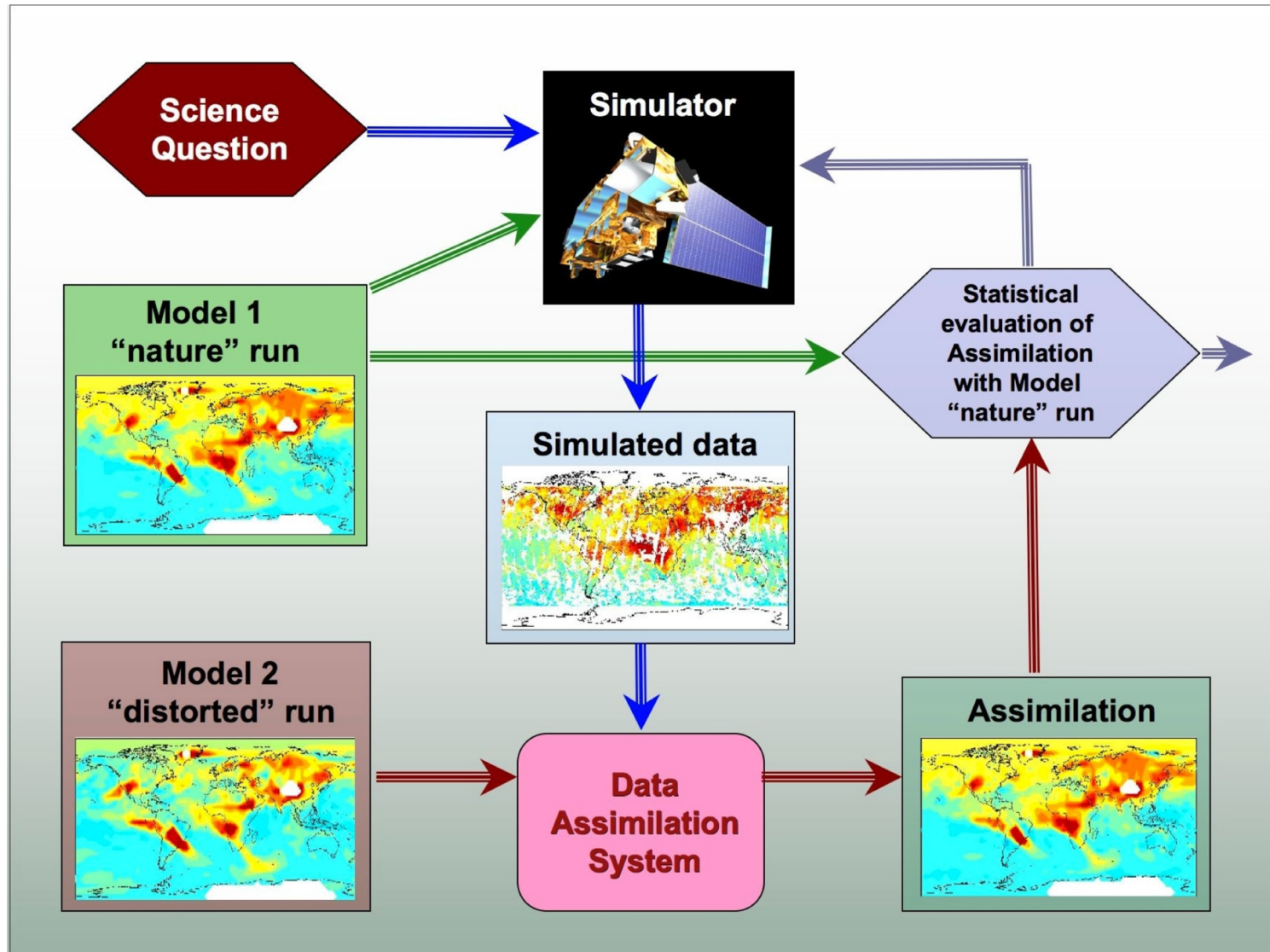


GMAO OSSE System: Generating synthetic observations

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AMS Annual Meeting Monday, January 24, 2022

What does OSSE really mean?





OSSE vs. DA using Real Obs

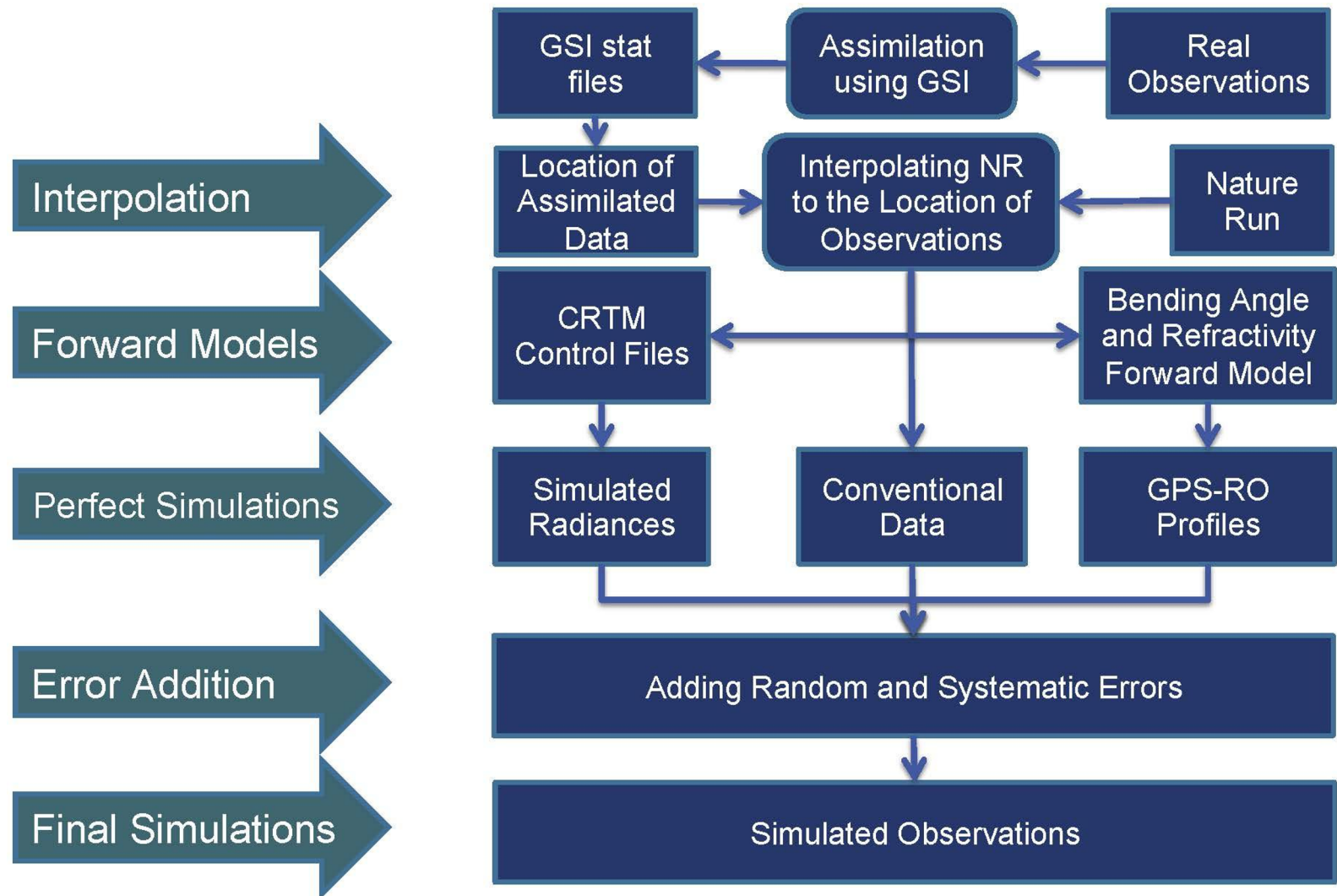
Data assimilation using real observations

- True atmosphere is sampled by imperfect instruments
- DA system can only be validated using sparse data such as radiosonde and dropsondes
- Real observations are only available from current instruments

Data assimilation using OSSEs

- Observations are simulated from a high-resolution NWP model known as "Nature run" using a forward model
- DA system can be easily validated since the true atmosphere (the "Nature run") is known
- Observations can be simulated for any future instruments as long as the forward model is available

Generating synthetic observations

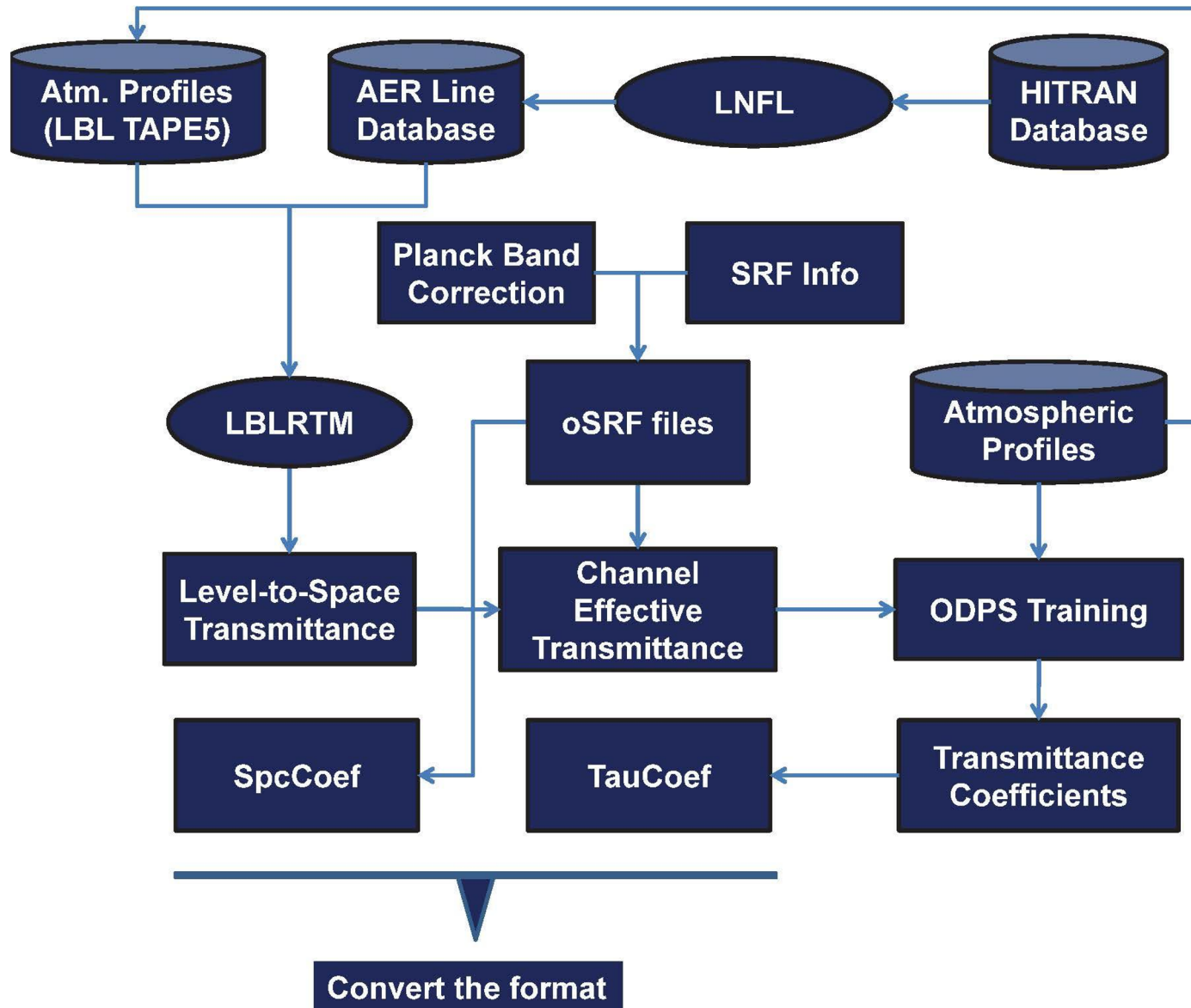




How do we do OSSEs?

- A new instrument is proposed, however not much information about the instrument is available
- CRTM coefficients are generated, often trial and error process to come up with channel set
- Synthetic observations are generated using GMAO OSSE for Weather Analysis Software Package (GOWASP)
- DA experiments are performed using synthetic observations (preferably error added OSSE obs)
- Analysis/Forecast is compared with the NR
- Observation impacts are analyzed

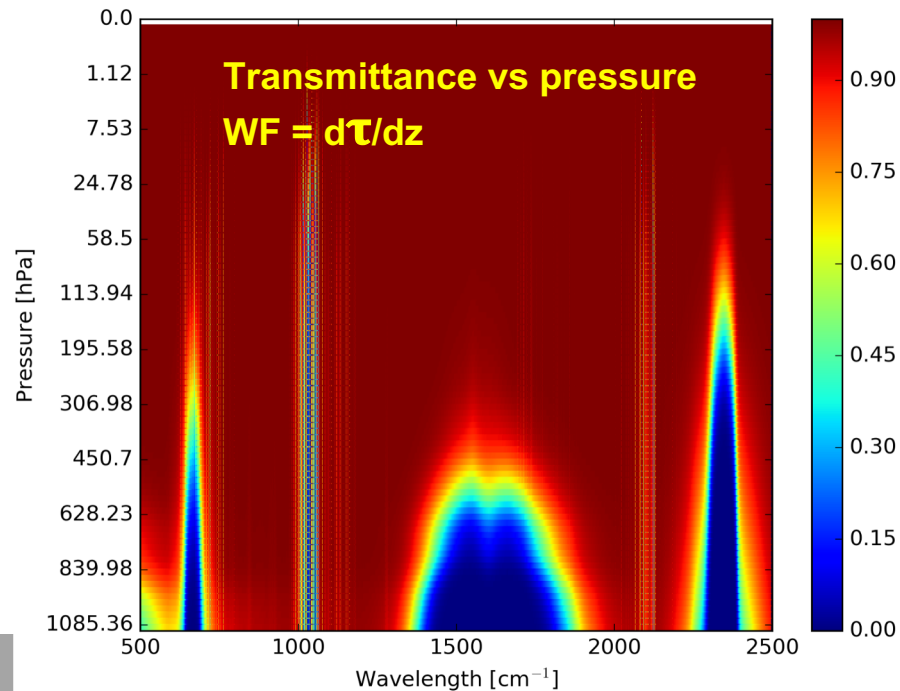
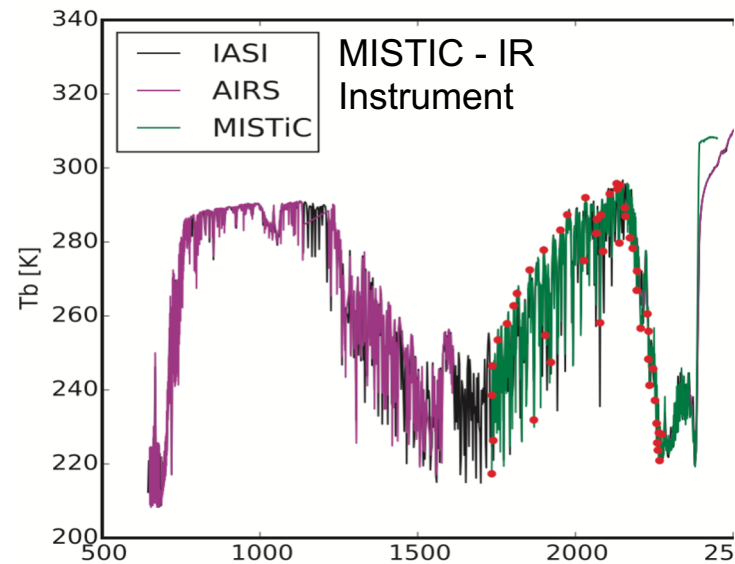
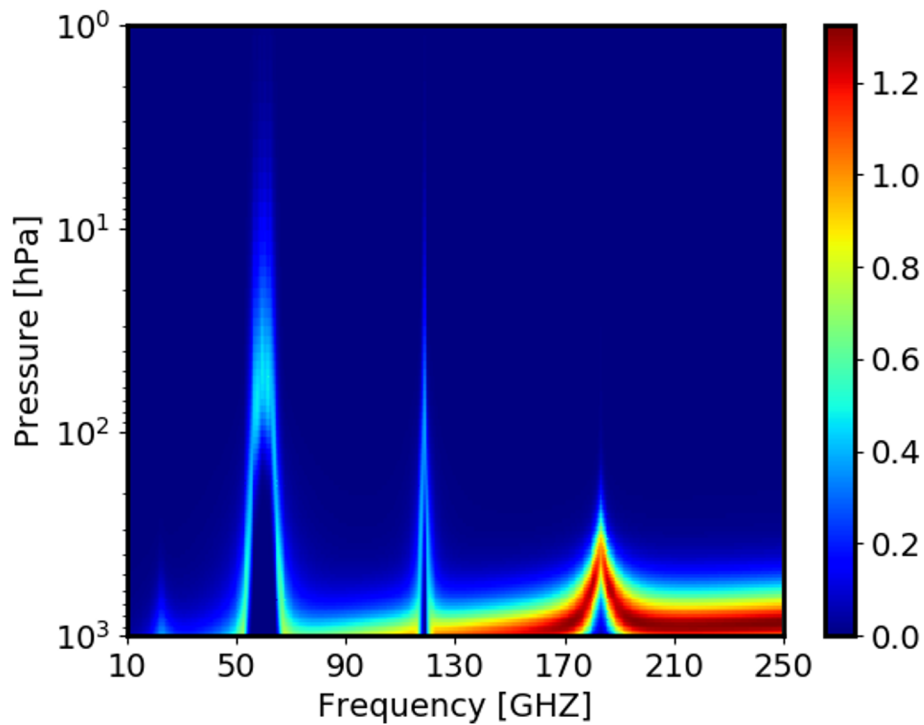
CRTM Coefficients



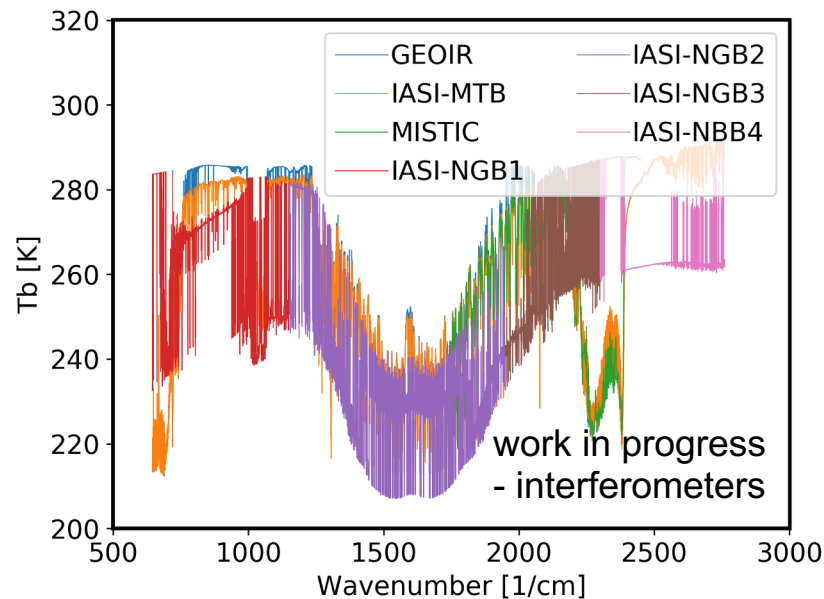
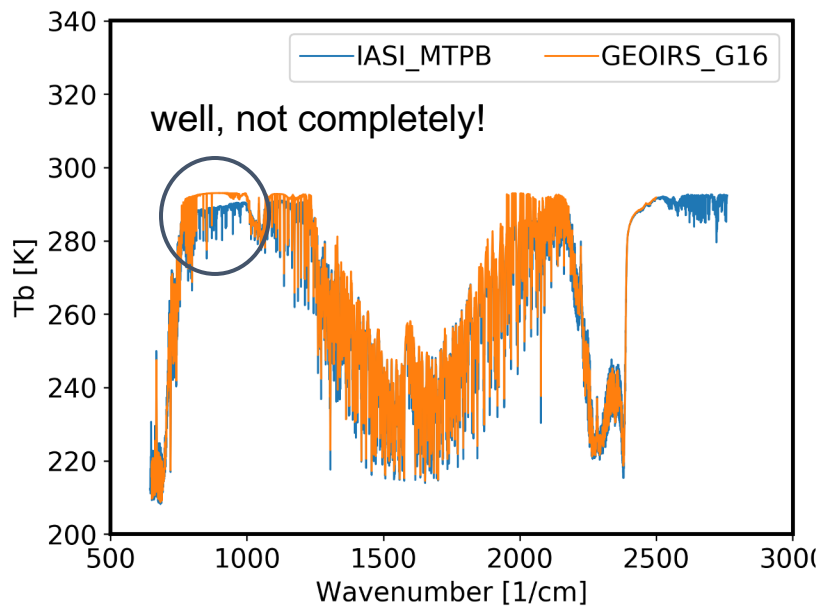
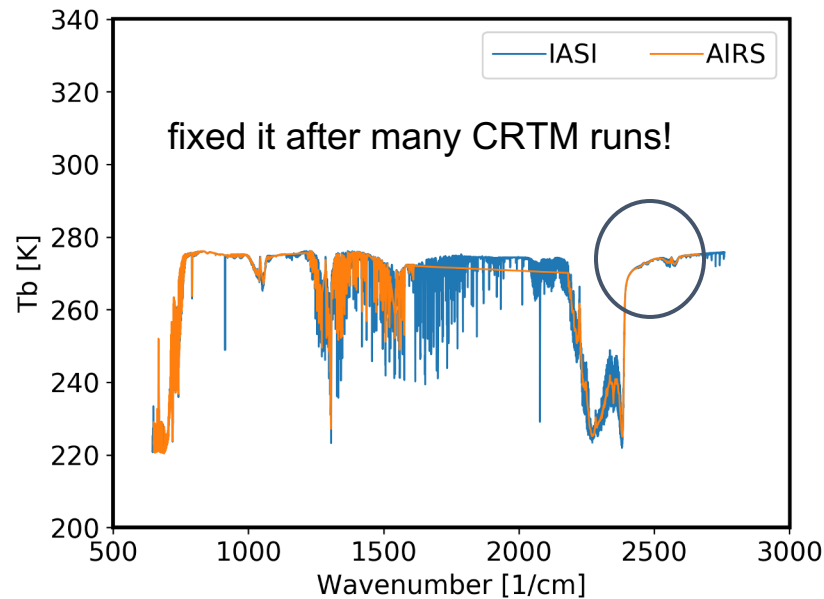
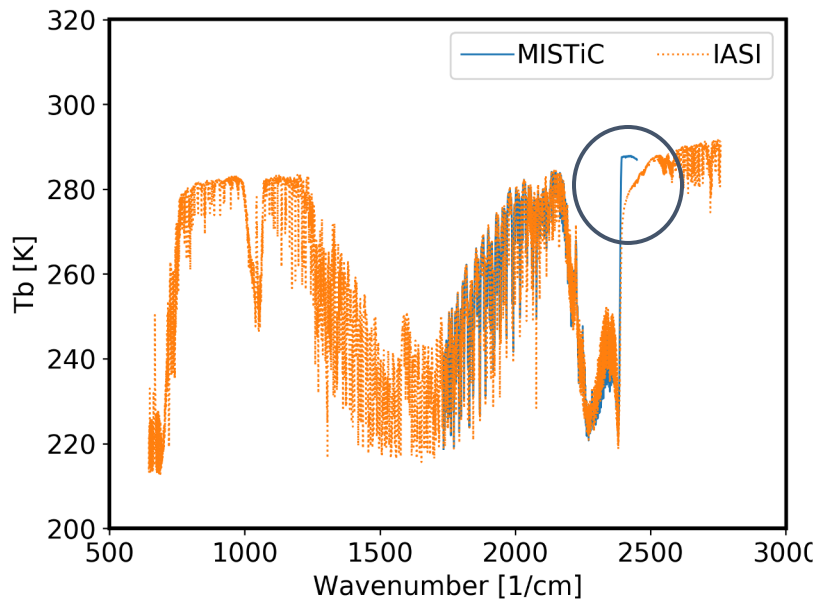
Channels sensitivity



HMW - MW Instrument

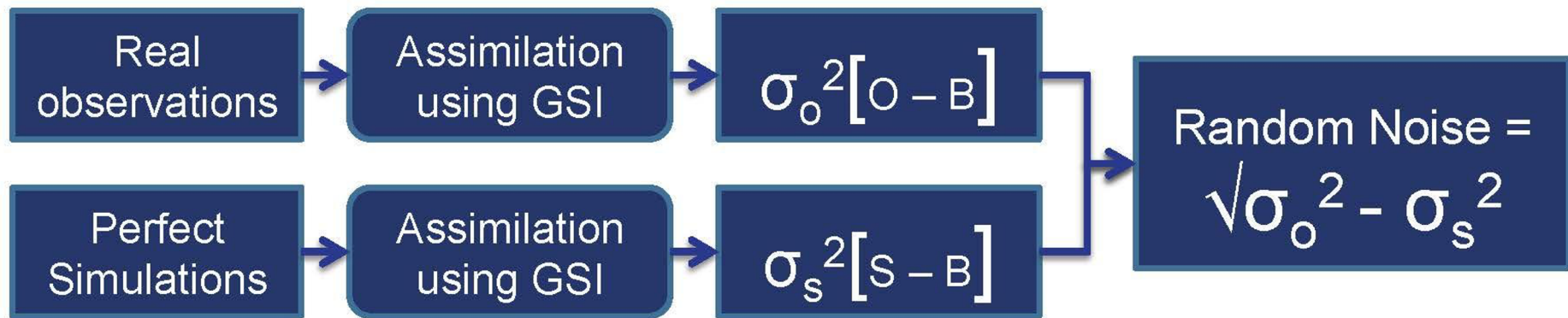


CRTM Coeffs Issues



Representativeness error to be added to the synthetic obs

- Observation noise
- Forward model (simulation) noise



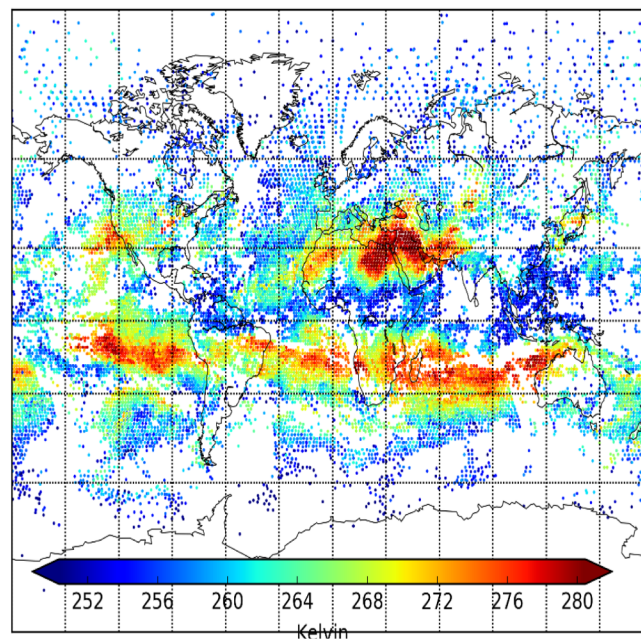
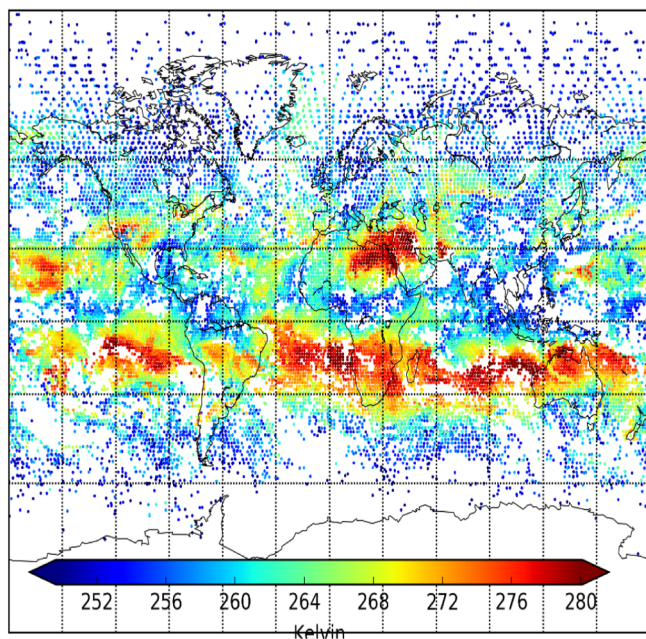
- For satellite radiances, correlated noise (in both spatial and channel domains) is added to each channel independently
- For conventional data, the random error is added separately for p,t,q,v and stratified by layers
- The GPS-RO random error is added for bending angles

real

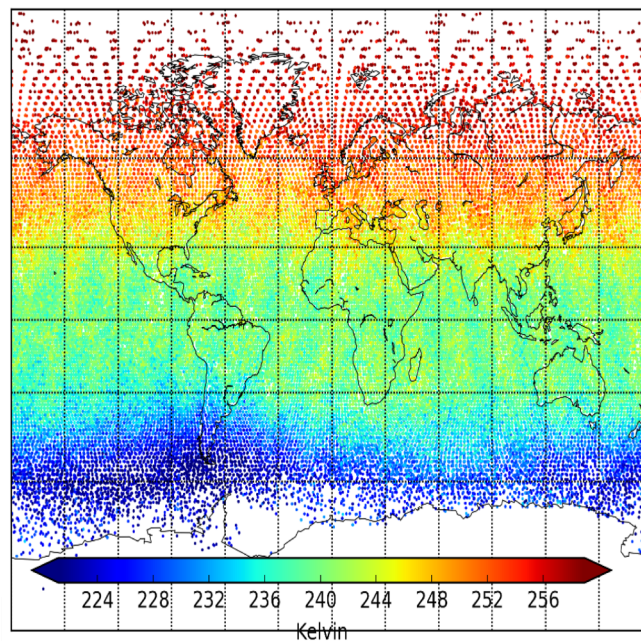
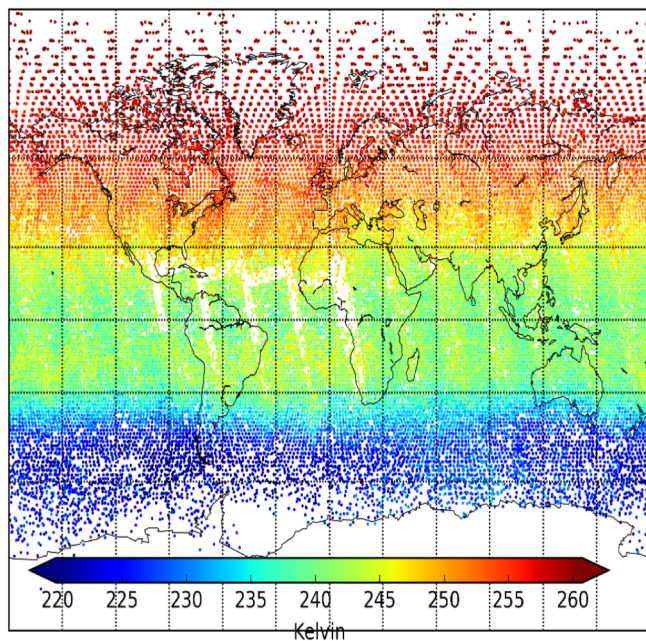
vs.

simulated obs

Water vapor



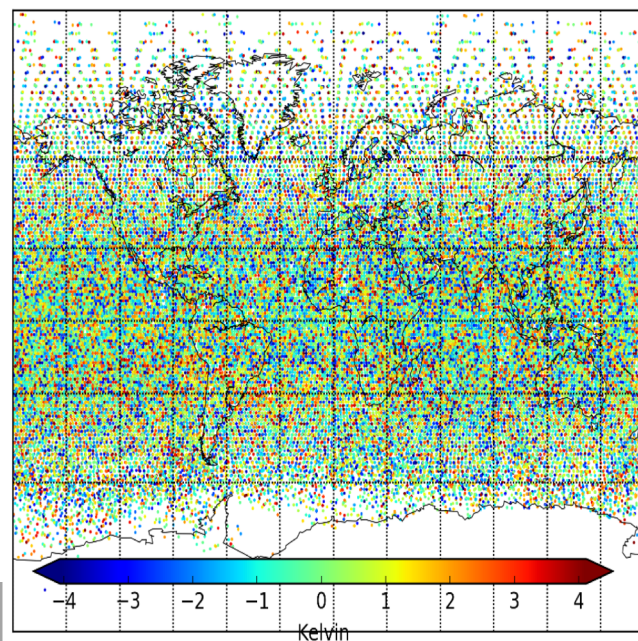
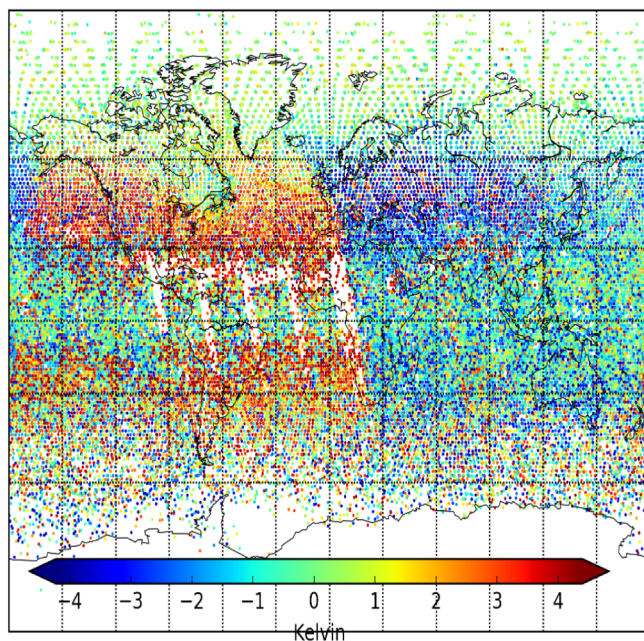
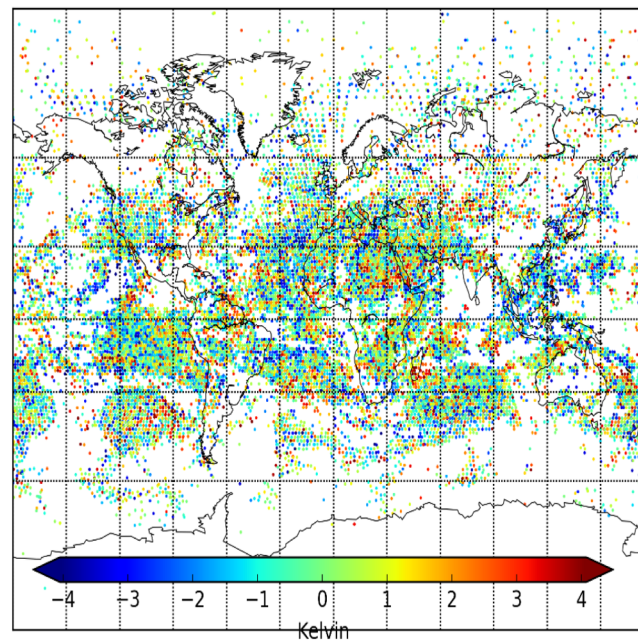
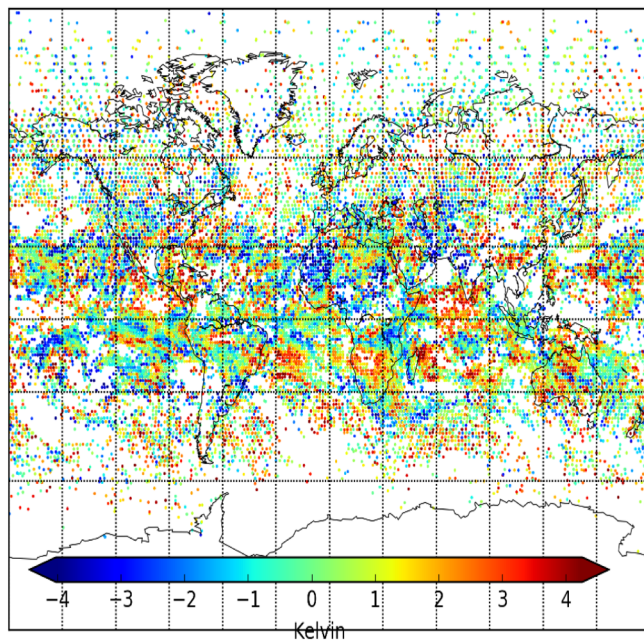
Temperature Sounding



real

omf values
vs.

simulated obs





Conclusion!

- OSSE's provide a powerful tool to evaluate the impact of future instruments/observations on the forecast and analysis
- The application of OSSE's is limited by several factors, especially the limitations in generating observations mimicking the real world, that need to be taken into account when interpreting the results
- A great capability for conducting OSSE experiments is developed at GMAO, but with the introduction of JEDI, we may need to revisit many of the OSSE tools we are currently using